implementations, a portion of the memory subsystem 330 may be combined with the controller 310.

In a preferred embodiment, the controller 310 comprises a microprocessor and a microcontroller. The microcontroller has much lower power consumption than the microprocessor and is used to implement low power level tasks, such as monitoring button presses and implementing a real-time clock function of the digital camera 300. The microcontroller is primarily responsible for controller 310 functionality that occurs while the digital camera 300 is in 'standby' or 'shutdown' mode. The shutdown mode is a mode of the digital camera 300 when the camera 300 is being turned 'OFF'. The microcontroller executes a simple computer program that, among other things, monitors button presses and maintains a real-time clock. Preferably the simple computer program is stored as firmware in read-only memory (ROM), the ROM preferably is built into the microcontroller.

On the other hand, the microprocessor implements the balance of the controller-related functionality. In particular, the microprocessor is responsible for all of the computationally intensive tasks of the controller 310, including but not limited to, image formatting, file management, and digital input/output formatting. In the preferred embodiment, the microprocessor executes the control program 360 that implements the method 100 of the present invention.

Figure 4 illustrates a block diagram of the imaging subsystem 320 of the digital camera 300. The imaging subsystem comprises optics 322 and an image sensing and recording 324 portion. The sensing and recording 324 portion preferably comprises a charge coupled device (CCD) array. During operation of the camera 300, the optics 322 project an optical image onto an image plane of the image sensing and recording 324 portion of the imaging system 320. The optics 322 may provide either variable or fixed focusing, as well as optical zoom (i.e. variable optical magnification) functionality. The optical image, once focused, is captured and digitized by the image sensing and recording 324 portion of the imaging subsystem 330. Digitizing produces a digital image. The controller 310 controls the image capturing, the focusing and the zooming functions of the imaging subsystem 320. When the controller 310 initiates the action of capturing of an image, the imaging subsystem 320 digitizes and records

the image. The digital image is then transferred to and stored in the memory subsystem 330.

The memory subsystem 330 comprises computer memory for storing digital images, as well as for storing the control program 360. Preferably, the memory subsystem 330 comprises a combination of non-volatile flash memory (e.g., electrically erasable, programmable, read only memory) and random access memory (RAM). The flash memory is used to store the control program 360, while the RAM is used to store digital images from the imaging subsystem 320 before the images are transferred to some type of non-volatile memory, such as a compact flash card, disk drive, etc. In particular, the flash memory stores a lock-out and bypass recognition portion (e.g., password template) of the control program 360 so that the security lockout cannot be circumvented by temporarily removing power from the digital camera 300. In addition, it is preferable that the control program 360 be stored in an area of the memory subsystem 330that is checked during a firmware upgrade, so that the security lockout cannot be defeated by uploading a new control program 360 without first authenticating the user. The memory subsystem 330 may also store a directory of the images and/or a directory of stored computer programs therein, including the control program 360.

The interface subsystem 340 is illustrated as a block diagram in Figure 5. The interface subsystem 340 comprises buttons 342 used by a user to interact with the control program 360 executed by the controller 310, thereby affecting user initiated control of the digital camera 300. For example, a button 342 may enable the user to initiate an image recording (i.e., 'snap a picture'). Another button 342 may function as an ON/OFF switch, allowing the camera to be turned ON or OFF. Additionally, the buttons 342 can act as 'arrow' keys to allow a value to be incrementally controlled, or enable the user to navigate a menu and make selections. Furthermore, the buttons 342 can be used to enter a password as a lockout bypass. One skilled in the art is familiar with buttons that are used to provide user interface to a digital camera 300 or other electronic device 200.

The interface subsystem 340 further comprises an image display 344. The image display 344 enables the user to view a digital image stored in the memory

subsystem 330. In addition, the image display 344 can provide a 'real-time' view of the image incident on the image sensing and recording 324 portion of the imaging system 320. In addition to viewing images, the image display 344 provides a means for displaying menus allowing the user to select various operational modes, and directories allowing the user to view and manipulate the contents of the memory subsystem 330. The image display 344 can also be used to display a request for password along with the owner information if a valid lockout bypass is not received. The image display 344 is typically a liquid crystal (LCD) display or similar display useful for displaying digital images.

The interface subsystem 340 further comprises an optional status display 346. The optional status display 346 provides ancillary information regarding the operational status of the digital camera 300. The status display 346 helps to reduce the 'visual clutter' of the image display 344. For example, the status display 346 might be used to display a fuel gauge that estimates power remaining in a battery. In addition, the status display 346 can be used to display to the user operational mode information, such as whether or not the digital camera 300 is in 'trigger mode', or is 'ON' or 'OFF'. Typically, the status display 356 is an LCD display, although is a much less complex LCD display than that used for the image display 344.

The control program 360 implements a control algorithm that coordinates and controls the actions and operations of the subsystems 320, 330, 340, and 350. In particular, the control program 360 defines the operational meaning of the buttons 342 and generates and formats data displayed on the image display 344 and the optional status display 346; initiates image capturing and recording by the imaging subsystem 320; and implements data file storage and recovery by the memory subsystem 330. In short, the control program 360, in a first or conventional portion, implements a control algorithm that accomplishes all of the tasks necessary for conventional operation of the digital camera 300. The control program 360 is stored in the memory subsystem 330 and is generally referred to as the firmware of the digital camera 300. One skilled in the art is familiar with such digital camera 300 firmware. In particular, one skilled in the art can create digital camera 300 firmware that implements the conventional